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The Outlook with Bundle-branch Block

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A series of papers on patients with various degrees of heart block (Campbell, 1942, 1943a, b, 1944) was meant to be completed with one on bundle-branch block. But when the war ended, my Lumleian lectures on the paroxysmal tachycardias (Campbell, 1947) occupied all my time until I became deeply involved in problems of malformations of the heart and their surgical treatment. Recently, when clearing out some filing cabinets I found these data on 50 patients with bundle-branch block. As most of them had been followed till they died, it seemed possible that they might still be of interest, especially as one with left bundle-branch block when 32 is still leading an active life after another 32 years.

Length of Survival

These 50 consecutive patients with bundle-branch block had been followed until 39 had died, 23 within two years of my first seeing them, 15 within two to seven years, and 1 after ten years (Table I). The mean period of survival was two years (24·6 months). The 11 living had been followed for between three and seven years, for a mean of four and a half years (54·5 months).

These findings are worse than those for patients with complete heart block (Campbell, 1944), where two-thirds (instead of four-fifths) had died after a longer interval of 2·5 years (instead of 2 years). Considering the survivors, one-third were still living (instead of one-fifth) after a longer interval of 6 years (instead of 4½) (Table I). If one assumes that the survivors continue to die at the same rate as the others, the expectation of life for all can be calculated. It is only 3 years for bundle-branch block and 4·5 years for complete heart block. The survival rates at 1, 2, and 3 years of these patients with complete heart block, several of whom were treated with ephedrine, are almost identical with those reported by Redwood (1969) for patients treated with long-acting isoprenaline. Only after two years are they much worse than those treated by pacemaker, 62 instead of 72 per cent surviving, but no doubt my series included fewer of those seen soon after the onset of Adams-Stokes attack, the period of highest mortality.

White (1951) found an average survival time of 3·3 years for 555 patients with left bundle-branch block and only one-fifth living for 5 years. Corresponding figures for 281 patients with right bundle-branch block were 3·9 years with one-quarter surviving for 5 years. The poor outlook is widely accepted and even in patients admitted to a coronary care unit the mortality in those with bundle-branch block was 56 per cent compared with 26 per cent for the others (Hunt and Sloman, 1969). Wood (1956), however, has rightly emphasized that the prognosis is that of the underlying heart disease, and that with right bundle-branch block and an

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TABLE I

LENGTH OF LIFE AFTER RECOGNITION OF BUNDLE-BRANCH BLOCK AND OF COMPLETE HEART BLOCK IN 50 PATIENTS WITH EACH

	Mean length (yr.)	< 1 yr.	1–2 yr.	2–3 yr.	3–4 yr.	4–5 yr.	5–6 yr.	6–9 yr.	10 or more yr.
Patients who have died									
Bundle-branch block	2	14	9	3	6	2	3	1	1
Complete heart block	2·5	10	9	3	4	3	4	0	1
Patients who were still living									
Bundle-branch block	4·5	0	0	0	5	3	2	1	0
Complete heart block	6	0	2	3	3	1	1	3	3

otherwise normal heart it is the same as that of a normal subject.

The high risk of sudden death in bundle-branch block is perhaps less widely realized. Ten of these 39 died suddenly (26%): this is lower than the proportion with complete heart block, where it was 15 of 34 deaths (Campbell, 1944), i.e. 44 per cent, but more than half as much.

General Conditions, Age, and Sex

These patients were, as might be expected, elderly and with a preponderance of men. In most the heart was enlarged, in about half of them greatly so. At least 12 of the 39 had congestive or left-sided heart failure when first seen, sometimes with atrial fibrillation. In 2, there was complete heart block with Adams-Stokes attacks. There were, therefore, other reasons for a poor prognosis. In 6, the bundle-branch block was inconstant and was at least once and sometimes several times replaced by QRS complexes that were not unduly widened.

Age. The mean age was 56 years. Only 8 were under 40 years of age, and they are described later as Cases 2–9. These 8 were equally divided between the dead and the living, so had a greater effect in reducing the mean age of the smaller number still living. The former had died at a mean age of 59 and the latter were living at a mean age of 47 years. But if the 8 younger patients were omitted from both groups the difference was small, $59{\cdot}7 \pm 2{\cdot}4$ years (62 and 57) respectively, a mean age of just over 61 years.

Sex. Two-thirds were men (33 men and 17 women). The sex of the patients made much more difference to the prognosis than the age: 29 of 33 men had died (88%) but only 10 of the 17 women (59%).

Aetiology

Coronary or other myocardial diseases in 20 patients made this the largest group, three-quarters of whom were men. Only 7 gave a clear history of coronary thrombosis. I saw many patients with this condition so am rather surprised that this figure was not higher, especially as Hunt and Sloman (1969) found bundle-branch block in 10 per cent of their patients admitted to a coronary care unit. Congestive or left-sided heart failure was already present in 4 when they were first seen. Gross atheromatous changes were noted in 3, one of whom had aortic regurgitation and another atrial fibrillation. Complete heart block with Adams-Stokes attacks was present in 2, developing in one after her original diagnosis. The remaining 5 generally had very large hearts without valvular disease or hypertension. Bronchitis was troublesome enough to be recorded as an additional factor in two.

Hypertension in 15 patients (Table II) made this the second largest group. Two-thirds were men. In all the blood pressure was over 160/100 mm. Hg: in 5 it was over 240/140 mm. Hg, so there were other grave prognostic signs as well as the bundle-branch block; and in 5 others it was over 200/100 mm. Hg. Six of them had congestive or left-sided failure, and 3 had angina pectoris so should possibly have been moved to the first group. Alcoholism was recorded as an additional factor in one.

Rheumatic heart disease formed the third largest group, with 11 patients. There were 4 with aortic stenosis, but perhaps one of these aged 68 should have been classed as atherosclerotic in spite of a rheumatic history: the others were all between 45 and 50 years. Aortic regurgitation was the main lesion in 3, mitral stenosis in 3, and mitral regurgitation in 1 patient. I am slightly surprised that this group is so large but perhaps saw more rheumatic heart disease than most physicians, who themselves probably saw more than physicians of today. The 3 with mitral stenosis are reported individually among the younger patients (Cases 4, 5, and 6). This rheumatic group as a whole had about equal numbers of men and women. They were younger

TABLE II
AETIOLOGY OF BUNDLE-BRANCH BLOCK

Aetiology	No. of cases	Men	Women	Age (yr.) range and mean	Type of bundle-block	
					Left	Right
Coronary or other myocardial	20	15	5	48–76 (61)	11	3*
Hypertensive	15	10	5	52–75 (64)	15	0
Rheumatic, aortic	7	5	2	28–49 (45)	7	0
Rheumatic, mitral	4	1	3	22–57 (36)	0	3*
Syphilitic	2	1	1	48–56	1	1
No other disease	2	1	1	27–32	2	0
Total	50	33	17		36	7*

* The other 7 were uncertain (see text).

than those in the first two groups, mostly between 27 and 50 instead of between 50 and 75 years as the others were.

The next two groups were much smaller, 2 with syphilitic aortic regurgitation and 2 whose hearts were thought to be otherwise normal. Of the former, the man with a very large heart died after five months, but the woman with a smaller heart was still alive after three years. The 2 with hearts thought to be otherwise normal are Cases 2 and 3 among the younger patients. Case 2 has been found to be still in good health (1969) 32 years after the original diagnosis was made.

Mulcahy and Hickey (1967), reviewing 100 patients with left, and 60 with right bundle-branch block, found coronary and hypertensive heart disease the main causes, but chronic respiratory disease was often associated with right bundle-branch block.

Case 1

Fortunately the patient who had lived longest, 10 years, after his bundle-branch block was recorded, was a friend and colleague. Aortic regurgitation had been diagnosed when he was playing hockey for Oxford University. A rheumatic aetiology was generally accepted but, in retrospect, I wonder if it may have been an unusual effect of bicuspid aortic valves. He continued to lead an active and hard-working life, without strenuous games, till his death during sleep when he was 58, about 35 years later.

Ten years before this he had asked me to examine him because he was becoming slightly more breathless. I was shocked to find left bundle-branch block, though his aortic regurgitation and heart size seemed about the same; and knowing him and his wife well thought it best to keep this knowledge to myself. His ten more years, happy and at work, seemed a complete justification for saving them both much worry. Incidentally another colleague, in whom I found left bundle-branch block and said nothing, lived about the same length of time and died with left ventricular failure shortly before his 80th birthday. My reason for acting thus was that in both of them the left bundle-branch block was the only unfavourable part of a picture that was generally favourable.

The Younger Patients (Cases 2–9)

Of 8 patients under 40 years, 4 were still living.

Case 2, a Guy's nurse, aged 32, was found to have left bundle-branch block only because a cardiogram was taken when she had some extrasystoles after tonsillitis. Her heart appeared normal in every other way. She had always led a normal life and did so for the next six years. Even at that time I thought her bundle-branch block was congenital and of no prognostic significance. She became a sister-tutor and was Principal Tutor at a large well-known hospital for many years.

The patient had, when first seen, a small adenoma of the thyroid without hyperthyroidism. However, this developed later, and when 51 she saw me again and had a partial thyroidectomy. The left bundle-branch block was unchanged and was confirmed by chest leads (Fig. 1 and 2). She wrote to me again when 64 saying "I have had an uneventful health record except for two attacks of lumbago and my partial thyroidectomy. After leaving hospital I married but unfortunately my husband died last year. I do a tremendous amount of gardening, over an acre in extent, even lifting heavy stones in excavating a large pond. I am sure it was through the confidence you gave me, by telling me that I could consider myself normal, that I have enjoyed such excellent health over the years." The patient added "my only symptom is tightness in the middle of the chest if I hurry up a slight incline", apparently like so many others without recognizing this as angina because it was "tightness" and not pain.

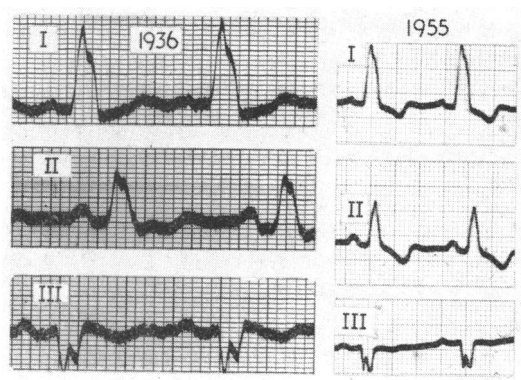

Fig. 1.—Standard leads of Case 2 in 1936 and 1955.

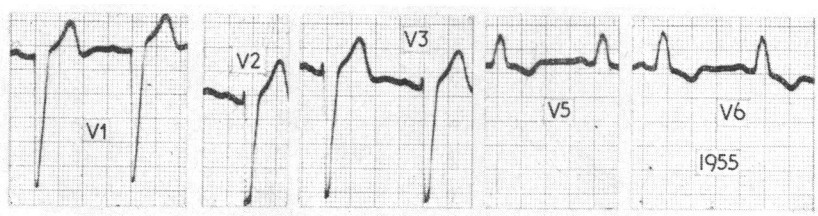

Fig. 2.—Chest leads of Case 2 in 1955, confirming left bundle-branch block.

She has now been warned not to hurry up hills, and to do nothing in the garden that brings on the tightness.

I see no reason to think her angina pectoris at 64 means that bundle-branch block at 32 already indicated coronary arterial disease then. If this is wrong, it is almost as remarkable that she should have led such an active life for her second 32 years. Table I and the average figures quoted earlier include only the first 6 years of her follow-up at Guy's.

Case 3. A theological student, aged 27, attended my out-patient clinic for four years, generally with left bundle-branch block though on two separate occasions his QRS was not widened, and he had only left axis deviation. Generally he had atrial flutter, sometimes with 2:1, sometimes with 4:1 block, and sometimes irregular and variable. He complained mainly of the palpitation but sometimes of dyspnoea and was usually better with digitalis.

Apart from these two findings, no other evidence of heart disease could be found, but 10 years earlier he had been in bed several weeks with quinsy and pains in the joints. Unfortunately he could not be traced longer, but I never felt as optimistic about him as about Case 2.

Cases 4 and 5, the other 2 living patients, were women aged 22 and 30; both had mitral stenosis and right bundle-branch block. The former had little enlargement of the heart and few symptoms and was seen over 7 years; the latter had an enormous heart but did not change much over 4 years' observation.

The 4 who died all had very large hearts. *Case 6*, a man aged 35, had mitral stenosis, right bundle-branch block, and congestive heart failure. He died with a cerebral embolism after 6 months. The other 3 all had left bundle-branch block and died after 6, 14, and 4 months, respectively.

Case 7, a man of 29, and *Case 8*, a woman of 28 years, both had free rheumatic aortic regurgitation which was much more important than their slight mitral stenosis: both died suddenly, though only the man gave a history of angina. *Case 9*, a man of 32, had bronchitis, atrial fibrillation, and recurrent congestive heart failure. The cause of his very large heart was not established.

The course in these younger patients was much as might be expected from their other symptoms and physical signs. There was no evidence that death was accelerated by the presence of bundle-branch block except possibly in the two who died suddenly.

Left and Right Bundle-branch Block

The reader may wonder why left and right bundle-branch block are not separated more clearly. Without chest leads or the knowledge that lead VI was decisive in settling cases that were uncertain on standard leads, a residue remained uncertain. In this series 36 had left bundle-branch block, 7 had right bundle-branch block, and 7 were uncertain.

Older readers will remember that for a long time most physicians called left bundle-branch block right, and vice versa. They were misled by experimental work on dogs (Eppinger and Rothberger, 1910) where the heart is much more vertical. The modern view was settled by the work of Barker, Macleod, and Alexander (1930), Marvin and Oughterson (1932), and finally by Wilson and his colleagues (Wilson, Macleod, and Barker, 1932; Wilson *et al.*, 1934; Wilson, 1942). We were then, I think, slower to accept American work. In this early period I preferred to speak of "divergent" and "convergent" bundle-branch block, but considering the association of left bundle-branch block with hypertension and aortic valve disease and of right bundle-branch block with mitral stenosis (Campbell, 1935) it is surprising the error continued for so long. As early as 1920, Fahr had suggested the correct solution on theoretical grounds.

Summary

Patients with bundle-branch block usually have a poor outlook, the mean time of survival being less than four years. A few without other unfavourable signs or symptoms may, however, get on well for much longer, and this is more common with right than with left bundle-branch block.

In this series of 50 patients, two, both with left bundle-branch block, did well. A man led a normal life for 10 years before dying in his sleep. A woman aged 32 has continued an active life for another 32 years and is well and active at 64 years. Even apart from her, the prognosis is less serious in women than in men with bundle-branch block.

One-quarter (26%) of these patients died suddenly. This risk of sudden death is perhaps not realized widely. It is not as great as in those with complete heart block (44%) but is more than half of this.

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